$\therefore$ Zerr gets $\frac{23}{45}D=\frac{23}{45}$ of \$30=\$15$\frac{1}{3}$, and Ellwood gets $\frac{22}{45}D=\frac{22}{45}$ of \$30=\$14$\frac{2}{3}$.

Also solved by Professors *MATZ*, *PHILBRICK*, and *ZERR*.

NOTE:—H. W. Draughon remarks of Professor Zerr's solution of prob. 9, that the method fails unless the original equations are factored as in (1), (2), and (3) of solution; that they can not be so factored unless the values of x, y, and z are known; and if these values are known, there is no need of solving. A similar comment has been received from Professor M. C. Stevens.

PROBLEMS.

29. Suggested by MANSFIELD MERRIMAN, C. E., Ph. D., Professor of Civil Engineering, Lehigh University, South Bethelehem, Pennsylvania.

Solve neatly the equations: $\dfrac{y(1+x^2)}{x(1+y^2)}=a\ldots.(1)$, and $\dfrac{y^4(1+x^8)}{x^4(1+y^8)}=b..(2)$.

30. Proposed by C. A. ROBERTS, Long Bottom, Ohio.

Find the sum of $n=10$ terms of the series $1+15+55+134+265\ldots.$

31. Proposed by D. G. DORRANCE, Jr., Camden, Oneida County, New York.

Sum the series 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, etc. to n terms. Also what is the nth term?

32. Proposed by LEV. WEINER, Professor of Modern Languages, Missouri State University, Columbia, Missouri.

Find a number consisting of 6 digits which when multipled by the first 6 natural numbers gives the same digits in rotation.

33. Proposed by C. E. WHITE, Trafalgar, Indiana.

Show that every algebraic equation of the nth degree, n being greater than two, which is complete in its terms may be transposed into an infinite number of equations which want their second term.

Solutions to these problems should be received on or before November 1st.

GEOMETRY.

Conducted by B.F.FINKEL, Kidder, Missouri. All Contributions to this department should besent to him.

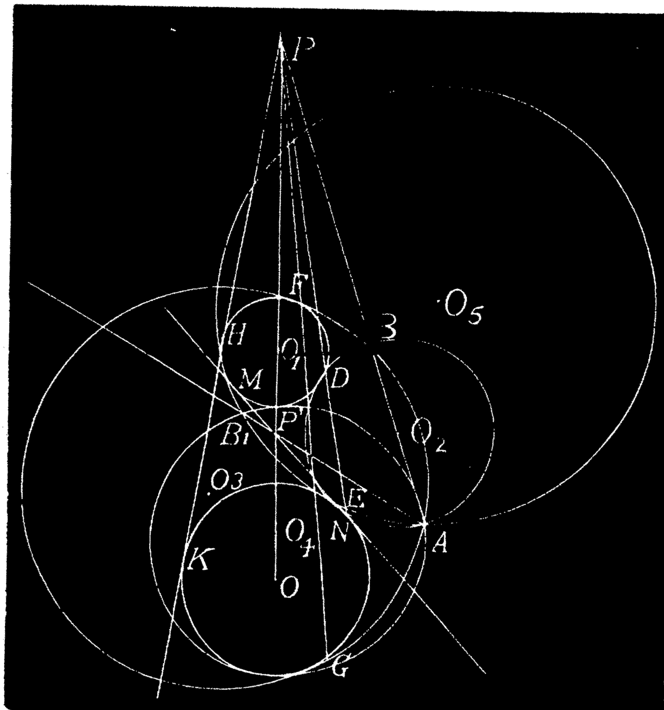
SOLUTIONS TO PROBLEMS.

14. Proposed by HENRY HEATON, M. S., Atlantic City, Iowa.

Through a given point to draw four circles tangent to two given circles.

II. **Solution by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.**

Let A be the given point O, O_1, the given circle, draw $P\ O_1\ O$ the line joining the centres of the given circles and PHK their common tangent. Let $AEDB$ be one of the circles satisfying the condition. Then $PA.PB=PO.PO_1=PK.PH=PE.PD$. Hence, join A to the point P and make $PA.PB=PK.PH$ this determines B; then a circle through A,B tangent to O_1 or O



satisfies the conditions, for $PA.PB=PE.PD$; but two such circles O_2, O_3 can be drawn. [See problem 18.]

Similarly draw the internal common tangent MN. Let P_1 be the point of meeting of this tangent with OO_1, Take $P_1N.P_1M=P_1A.P_1B_1$. This determines B_1 and through A,B_1 two circles can be drawn satisfying the conditions. These are O_4, O_5.

16. Proposed by H. C. WHITAKER, B. S., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

Three lights of intensities 2, 4, and 5 are placed respectively at points the co-ordinates of which are (0,3) (4,5) and (9,0). Find a point in the plane of the lights equally illuminated by all of them.

I. **Solution by J. F. W. SCHEFFER. A. M., Hagerstown, Maryland, and the PROPOSER**

$$\frac{2}{x^2+(y-3)^2}=\frac{4}{(x-4)^2+(y-5)^2}=\frac{5}{(x-9)^2+y^2}:$$